



# Automotive

by Shervin Shahidi Hamedani

# Screw and Fastener

## Automotive Industry

The global automotive sales market experienced a slow-growth in the first half of this year, but remained on target to climb to the sixth consecutive annual record as reported by Scotiabank. Supply chains and purchases are being supported by strengthening job creation in developed markets and rising consumer confidence across much of the globe.

In North America, both Canada and Mexico will set sales records in 2015, while volumes in the United States will exceed 17 million units for the first time since 2001. Strengthened labour markets are driving the gains across the NAFTA region, the North American Free Trade Agreement. Payrolls are advancing in Mexico, are growing at the fastest pace since the turn of the millennium in the United States and have gained momentum in Canada, especially in the industrial heartland of Central Canada and on the West Coast.

Western Europe has become the auto industry's growth leader in 2015, with volumes advancing in fifteen of the eighteen countries in the region and will approach a full-year total of 13 million units for the first time in five years. The improvement reflects strengthened labour markets and household balance sheets. Wages and salaries across the euro zone are advancing at the fastest

pace since 2008. Purchases are also strengthening among the new EU members in Central and Eastern Europe, with eight of the twelve countries posting double-digit gains this year.

On the other hand in China, car sales have softened from the double-digit pace of the past decade, dampening overall gains across Asia and prompting concern about the outlook. Consequently, automakers have launched significant price reductions to encourage customers back into showrooms, and are increasingly willing to sacrifice margins in order to sell more cars.

## U.S. Automotive Industry

Automakers and their suppliers are America's largest manufacturing sector, responsible for 3% of America's GDP. U.S. auto sales have increased by more than 58% since the 2009 financial crisis (from 10.4 million to 16.5 million in 2013). Last year, Americans bought more than 16 million cars and light trucks and expected to reach more than 17 million in this year.

One way to measure an industry's economic contribution is to consider the number of workers it employs through its own operations, its suppliers, and the other local businesses it supports. No other manufacturing sector generates as many American jobs. The industry directly employs more than 1.5 million people engaged in designing, engineering, manufacturing, and supplying parts and components to assemble, sell and service new

## 汽车螺丝与扣件 文 / Shervin Shahidi Hamedani

### 全球汽车产业概览

据加拿大丰业银行报告显示,今年上半年全球汽车销售市场成长缓慢,但仍维持住目标,并达成连续六年的攀升纪录。已发展国家市场增加的就业机会以及多数国家消费信心攀升支撑着全球的供应链与采购力。

在北美,加拿大与墨西哥将双双在2015年创下销售纪录。其中美国的销量自2001以来首度超越1,700万辆。劳动市场转强,为北美自由贸易区的国家带来收益。千禧年之后美国劳动薪资水平出现关键性转折,墨西哥的劳动薪资正以最快的速度升高,加拿大的劳动薪资也增加了成长动力,特别是在身为工业重镇的加拿大中部及其西岸。

西欧在2015年已成为汽车业的主要成长国,西欧18国中有15国的产量上升,且年销量也有很大的机会在近五年内首度突破1,300万辆,此波成长也反映出强化的劳动市场以及居家的资产负债状况。欧元区的薪资也正以自2008年以来的最快速度增加。中欧与东欧的12个欧盟新成员国采购力也在强化,其中有8个国家今年出现两位数收益。

另一方面,中国汽车销售脱离近十年来的两位数成长,销售力道转弱,拖累了亚洲的整体收益也引起业界对其未来前景的担忧。因此汽车制造商已开始明显地降价以刺激顾客回来购买,也有越来越多车厂宁愿牺牲毛利率以销售更多辆车。

motor vehicles. It is estimated that automakers and respective suppliers' employment in the U.S. will increase by more than one-third from 2011 to 2016.

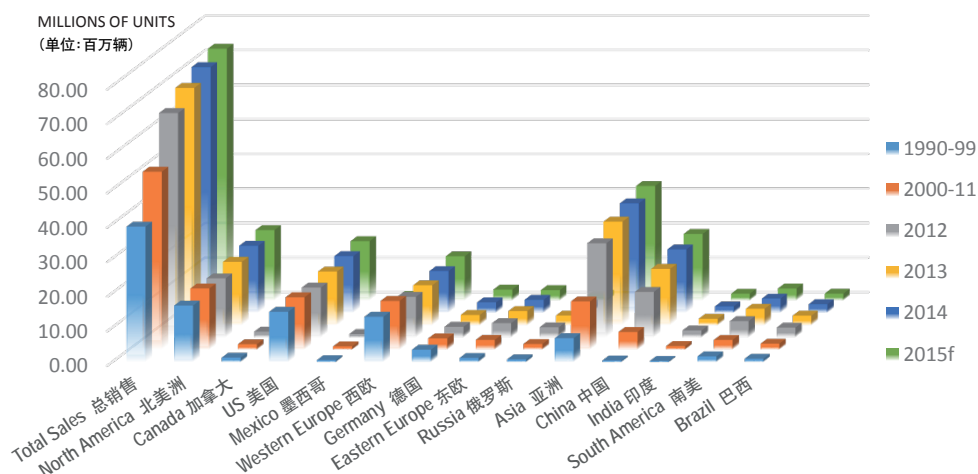
Automotive manufacturers have responded to new domestic cost advantages by shifting production from other countries such as Mexico and Turkey to the U.S. Over the past five years, automakers have exported more than \$637 billion in vehicles and parts which is approximately \$118 billion more than the next largest exporter (aerospace) which makes them the largest exporters in the U.S. Every year automakers buy hundreds of billions of dollars worth of American steel, glass, rubber, iron, and semiconductors. In regards with research and development, the auto sector ranks third out of the forty largest industries, on a global basis, in terms of spending. International automakers have 62 research and development centres located across the country. These facilities design some of the most innovative, fuel efficient, and safe vehicles on American roadways.

## Chinese Automotive Industry

Over the past three decades, Chinese automotive industry has risen to become the largest in the world both in terms of production and consumption. As the world's largest steel manufacturer, it has access to the raw materials needed to build huge numbers of vehicles for its own market and for export. It also has the resources to build as many factories as are required, as well as design innovation leadership and engineering skills.

The industry's rise has been carefully managed and nurtured by the Chinese government with the ultimate objective of developing a

## INTERNATIONAL CAR SALES OUTLOOK 全球汽车销售前景



domestically driven automotive industry. Their basic policy strategy has been to open market access to foreign automakers in exchange for technology transfer. As a result of this policy and opening its market to outside automakers, China has sought to build its own champions by requiring foreign firms to partner with domestic automakers for local production.

With few exceptions, the hope that sales of Chinese brands would surpass that of their foreign partners has vanished, as forced partnerships have failed to produce genuine innovation. With Chinese brands holding just 34.6 percent of the passenger car market through July of this year and global automakers enjoying

## 美国汽车产业

美国最大的制造业就是汽车业及其供应商，占了美国GDP的3%。美国汽车销量自2009年经济危机以后的成长涨幅超过58%，在2013年从1,040万辆上升到1,650万辆。去(2014)年美国购买了超过1,600万辆汽车，今年更预计超过1,700万辆。

衡量某个产业的经济输出量，其中一个方式是观察其事业雇用员工数、供应商结构，以及其所支持的当地事业活动。美国制造业产生的工作机会数量可说是世界之最。美国汽车产业雇用超过150万人从事设计、工程、制造，或供应组装用零件给新车。估计2011至2016年间车商与供应商的雇用人数将增加超过33.34%。

为迎接新的国内成本优势，汽车制造商将产制作业从墨西哥和土耳其等国迁移至美国。过去五年来，车商出口的汽车与零件额已超过6,370亿美元，比次要的大宗出口产业「航太业」多出了1,180亿美元，因此汽车与航太业是美国两个最大的出口产业。每年车商买入上千亿美元的美制钢品、玻璃、橡胶、铁与半导体。在研发方面，汽车业的开销在全球40大产业中排名第三大。国际型车商在美国各地设立的研发中心就有62个，这些单位负责开发行驶于美国道路上最创新、最省油、最安全的车。

## 中国汽车产业

过去三十年来，中国汽车业崛起成为全球产量和消费量最大的国家。身为全球最大的钢铁制造国，中国可取得原物料来为其市场与出口业生产数量庞大的汽车。中国也有资源可以建设所需数量的工厂，也可设计具创新能力的领导组织并拥有足够的设计能力。

中国政府小心规划并培育汽车业，终极目标是发展国内自主的汽车业。中国的基本策略是对海外车商开放市场以换取技术转移。基于此策略并开放市场给海外车商，中国得以借由要求外资与国内车商合作在地化生产以建立中国自身的市场地位。

huge profits in China, the country seems to have recognized that its own automakers are unlikely to catch up without additional help.

## Automotive Fasteners

The United States, Europe and Asia-Pacific lead the worldwide automotive fasteners market, as stated in a report by Global Industry Analysts, Inc. In the United States, changing dynamics of the automotive industry and quality of products are expected to influence growth prospects in the automotive fasteners market. Introduction of automated assembling processes in



但这出现了些许意外，由于强制性的结盟无法产生真正的创新，中国品牌超越外资品牌的期待已消逝。今年1至7月中国国产品牌只占小客车市场的34.6%，但全球车厂却在中国坐享巨大的利润，中国似乎已体认，国产车商若无他力则无法赶得上。

## 汽车扣件

「全球产业分析」公司的报告中提到美国、欧洲与亚太地区主导全球汽车扣件市场。在美国，汽车产业趋势以及产品品质的波动预计将影响汽车扣件市场的成长前景。汽车扣件引进自动化组装制程预计可带来品质的提升。

所谓的汽车扣件，是指一种机械装置或零件，包括螺栓、螺帽、螺丝、螺柱、铆钉、插销等等，用于支撑连接某个结构体中两个或更多物件。汽车扣件的材质多元，包括不锈钢、铁、铜、铝、镍等等。虽然汽车扣件用途广泛，包括航太、国防、石化，但在这里只会简要提及汽车产业用到的各种扣件。

汽车扣件中的螺栓(通常是有螺纹的螺栓)，包括一支螺纹插销或其中一端有头部的螺条。螺栓穿过组装件上的孔洞并透过扭力与搭配的螺帽接合。市场上有许多种类的汽车螺栓，例如轮胎螺栓、车毂螺栓、U型螺栓，以及所有的组装盘专用螺栓等等。

汽车扣件中另一重要类别的螺帽通常是四角或六角金属结构。这些螺帽大多有个螺纹孔用于拧紧螺栓以暂时或永久紧固结构物。汽车专用螺帽有许多不同种类，包括筒易螺帽、带环螺帽、定位螺帽、T型螺帽、六角螺帽、锁紧螺帽、四角螺帽、托板螺帽、自锁螺帽、不锈钢螺帽等等。

the production of automotive fasteners are expected to result in improvement of product quality.

Automotive fasteners are the mechanical devices or components like bolts, nuts, screws, studs, rivets, pins, etc., used for holding or connecting two or more objects together in a structure. Automotive fasteners are made up of a variety of metals such as stainless steel, iron, brass, aluminium, nickels etc. Although fasteners are widely used in a number of industries such as aerospace, defence, petrochemical, in this part, we briefly review the various types of fasteners utilized in the automotive industry.

Automotive bolts often known as threaded fasteners are one of the types of auto fasteners which includes either a threaded pin or rod having a head at one end. The bolts are inserted through holes in assembled parts and fastened by mated nuts with helps of torques. A wide variety of automotive bolts are available in the market such as wheel bolts, hub bolts, U-bolts, all mounting plates bolts, etc.

The other important types of auto fasteners are nuts which are usually square or hexagonal shaped metal. Those nuts mostly have a threaded hole used for screwing a bolt that holds together temporary or permanent structures. Automotive nuts can be of different types such as simple nuts, collar nuts, locking nuts, T-nuts, hex nuts, jam nuts, lug nuts, plate nuts, self-locking nuts, stainless steel nuts, etc.

Studs are commonly referred to as double ended automobile fasteners. Automotive studs are fastened at both the ends with the help of an unthreaded shank. With the growing automotive parts industry, various automotive fasteners manufacturers & suppliers are coming up with new materials to manufacture a variety of auto studs.

The other essential auto fasteners are washers, the small flat dishes having a hole in the centre, which are generally made of metal, leather, plastic, and rubber. The main function of the automotive washers is to hold or bear the load of a threaded fastener or bolt. Washers are just put below a nut, axle bearing or joint with the main purpose of preventing leakage and distributing pressure.

The oldest forms of automotive fasteners are rivets traditionally utilized in building wooden boats, but now rivets are used as automobile fasteners in a wide number of applications like aircrafts, bridges, cranes, building frames, etc. Rivets are often regarded as a mechanical fastener having a cylindrical shaft with head on one hand.

## Automotive Screws

Screws are one of the most common threaded fasteners and the most important types of automotive fasteners which consist of a tapered threaded shank and a slotted head. Many different types of screws which are usually made up of metal are mainly used for holding tightly different types of objects together. The hex head cap screw is one of the most common types. Since early 90s a specific type of screw, known as torque-to-yield, has been used to hold high pressure and high force components



together. Another type of screw is the socket screw that has excellent holding power than nails and can be reused again. Recently automakers have started to utilize screws with an Allen or Torx head, mainly when space is limited. Many other screws are used to hold various automotive parts together with different sizes and materials that make this type of fastener, screw, one of the most important parts in this industry.

The market for automobile screws will be assisted by superior production technology, increased production of automobiles, changing pattern of consumption and evolving export market. The increasingly complex nature of vehicular designs requires stronger, improved and durable automotive screws. Technological improvements have played a critical role in transforming fasteners, in general, and screws, in particular, into multi-purpose highly engineered automotive components. New age cars demand economical and user-friendly fastening options that can replace mechanical fasteners and are also effective in holding together rubber, aluminium and plastic parts. In such a scenario, chemical fastening methods (including adhesives) and 'snap-fit' or self-securing fastening solutions are emerging as popular choices. Accordingly, inappropriate selection of screws and any other fasteners can lead to a high rate of vehicle recalls, and stepping up of warranty costs. Failure of fasteners has emerged as a leading contributor to the recall of vehicles in Europe and North America. However, advancements in the technological area, new quality management methods, and improving production processes are expected to reduce their defects.

## In Summary

The good news for automakers and suppliers in this industry is that all segments are predicted to increase in volume. Within the next few years, global vehicle sales will pass the magical 100 million mark and continue to rise until the end of this decade, on the back of increasing demand in emerging markets like China.

It is notable that, in this growing market but extremely competitive marketplace

that is influenced by changing dynamics of automotive industry, survival of automotive fastener suppliers depends on factors such as technological improvements, diversity of product offerings and pricing. Further, suppliers with global presence are expected to hold an edge over their competitors.

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螺柱又称双头汽车扣件，汽车专用螺柱要透过无螺纹的杆部固定住两端。随着汽车零件市场成长，许多汽车扣件制造商与供应商正使用新的原料制造多种汽车螺柱。

其他重要的汽车扣件包括垫片，是中心有打孔的小扁盘，这些扣件通常材质是金属、皮革、塑胶和橡胶。汽车专用垫片的主要功能是支撑或承受螺纹扣件或螺栓的载重。垫片就放在螺帽、轴承或接合件的下方，主要用于防漏或平均分配压力。

铆钉是历史最久远的一种汽车扣件，以往传统上是用于建造木造小船，但如今铆钉则被当作汽车扣件来使用，应用领域也很广，包括飞机、桥梁、起重机、建筑架构等等。铆钉通常被视为一种机械用扣件，拥有圆柱体的杆部，其中一端有头部。

## 汽车螺丝

螺丝是最常见的螺纹扣件，汽车扣件中最重要螺丝在构造商包括锥形螺纹杆部以及有沟槽的头部。许多不同种类的螺丝(大多是金属制)主要用于将不同种类的物件紧固在一起，六角带帽螺丝是最常见的一种。自90年代开始，业界就开始使用一种称为降伏扭矩螺丝的特定扣件来紧固高压且强力的零件。另一种螺丝是内角螺丝，它比起钉子拥有绝佳的紧固力且可重复使用。最近车厂已开始使用内六角头和梅花头螺丝，应用于受限的空间。其他种类的螺丝则用来紧固各种不同尺寸和材质的汽车零件，也使得螺丝成为汽车业最重要的零件。

顶尖的制造科技、汽车产量的增加、销售模式的改变以及不断演化的出口市场，都将在背后支撑汽车螺丝的市场。越来越错综复杂的车体设计将需要更强、更优化且更耐用的汽车螺丝，尤其这些螺丝必须能用在多用途的高端精密汽车零件上。新时代的汽车需要经济实惠且使用方便的紧固方案，除了要能取代机械扣件之外也要能有效紧固橡胶、铝和塑胶零件。在这背景下，化学紧固方案(包括黏着剂)、扣合(snap-fit)扣件或自锁紧固扣件成为热门选项。选择不适当的螺丝和扣件就会使汽车召回率和保固成本升高。在北美和欧洲，失效的扣件已成为汽车召回的主因，但技术革新、新的品管方式和改善的制程则可望降低扣件的缺陷。

## 总结

对车厂和供应商来说，好消息是汽车业的所有附属产业都可望增加产量。在接下来的几年内，由于中国等等新兴市场的需求增加，全球汽车销量将超越1亿辆大关并持续在十年内升高。

值得注意的是，市场受到汽车产业波动的影响，在这持续成长却又极度竞争的市场下，汽车扣件供应商的生存仰赖科技进步、产品供应的多样性以及定价。此外，在全球设有据点供应商则将比起其他竞争者有拥竞争优势。